



# NATIONAL SNOW AND ICE DATA CENTER

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## Annual Report, Year 3 for University of Colorado Activities under the RADARSAT ANTARCTIC MAPPING PROJECT

### Project Summary

The Radarsat Antarctic Mapping Project has as its objective the mapping of the entire land surface of the continent of Antarctica using the Radarsat SAR satellite. The satellite was flipped to a southward mode in September, 1997, for a period of about 5 weeks, facilitating not only the complete mapping of the continent but also a substantial amount of interferometric data.

The University of Colorado portion of the RAMP effort is a supporting role in the gathering and interpreting of elevation data sets for the project, to be used in the initial processing of the raw SAR data, and to be modified and improved for inclusion with the final product, an image map and DEM of Antarctica.

NSIDC's support under RAMP covers approximately 3 weeks per year salary for a remote sensing scientist, and one trip per year for conferring with other RAMP PIs and users.

NSIDC currently archives radar altimetry data and other maps which represent a source data for the DEMs of the Antarctic continent. NSIDC also archives AVHRR data from which medium-resolution mosaics of the Antarctic continent can be derived for comparison with the Radarsat images.

As a data center, NSIDC is also providing input on data formats and other data distribution considerations, and anticipates being a distribution point for the Radarsat RAMP data when it is completed.

### Activities during Year 3

The DEM for the Antarctic RAMP project was finalized in the Summer of 1997, with some assistance from NSIDC in gathering smaller, ancillary elevation data sets over the southern portions of the West Antarctic Ice Sheet. Specifically, NSIDC provided elevation profiles from the Siple Dome area and acquired and passed on data from late-1980's airborne radar altimetry acquired by Dr. Charles Bentley. Also during this time, improvements were made in two image processing techniques for AVHRR, data cumulation and photoclinometry, that may assist in verifying the RAMP imagery and in improving the DEM for future applications.

Because AVHRR is a visible/near-IR sensor, it acquires images of the true surface; there is no volume scattering component as with SAR, and much less response to surface roughness. This volume and surface scattering can be a source of ambiguity in

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interpretation of image features in SAR: bright areas may indicate surface slope or variations in the radar scattering character, either buried or at the surface. By comparing the two data sets it should be possible to discern what areas are brighter due to surface morphology, and what areas may be indicating subsurface variations or roughness variations. This application of AVHRR data was also recently discussed at a presentation by a student at Ohio State during the Midwest Glaciology Meeting last month. The focus of the presentation was on interpreting brightness variations near the South Pole station.

It is also possible to verify and further examine important discoveries made by RAMP using AVHRR. Both snow megadunes and the East Antarctic ice streams are easily visible in AVHRR images, and a composite image of the ice streams was available for comparison at the first RAMP meeting at Ohio State where data was presented.

#### **Plans for Year 4**

Continued involvement in planning and refining the scientific objectives of the RAMP mission, and continued support of DEM improvements is anticipated. NSIDC will coordinate the transfer of available data on airborne elevations in the southernmost section of Antarctica to continue to improve the DEM. NSIDC will also offer AVHRR imagery of the continent during the early phases of processing for comparison with the early images produced by Radarsat for RAMP. In regions south of 84° S, Radarsat will provide the first (publicly-available) high-resolution satellite images, and only AVHRR data is available for comparison. As the photogrammetry techniques improves and matures, data from areas with enhanced DEMs using images and elevation data will be contributed to the RAMP effort.

No changes to the budget are foreseen for the next annual funding period, and the initial budget request should allow NSIDC to fulfill its responsibilities under the proposal.